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Brownlee Reservoir, Baker County, Oregon, and Washington County, Idaho

(U.S.) National Eutrophication Survey, Corvallis, Oreg

Prepared for

Corvallis Environmental Research Lab, Oreg

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U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

BROWNLEE RESERVOIR

BAKER COUNTY, OREGON

WASHINGTON COUNTY, IDAHO

EPA REGION X

WORKING PAPER No. 827

WITH THE COOPERATION OF THE

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY,

THE IDAHO DEPARTMENT OF HEALTH AND WELFARE,

AND THE OREGON NATIONAL GUARD

MARCH, 1978

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGEMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Oregon Department of Environmental Quality and the Idaho Department of Health and Welfare for professional involvement and to the Oregon National Guard for conducting the tributary sampling phase of the Survey.

William H. Young, Director; Harold L. Sawyer, Administrator, and the staff of the Water Quality Control Division of the Oregon Department of Environmental Quality; and the staff of the Division of Environment of the Idaho Department of Health and Welfare provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

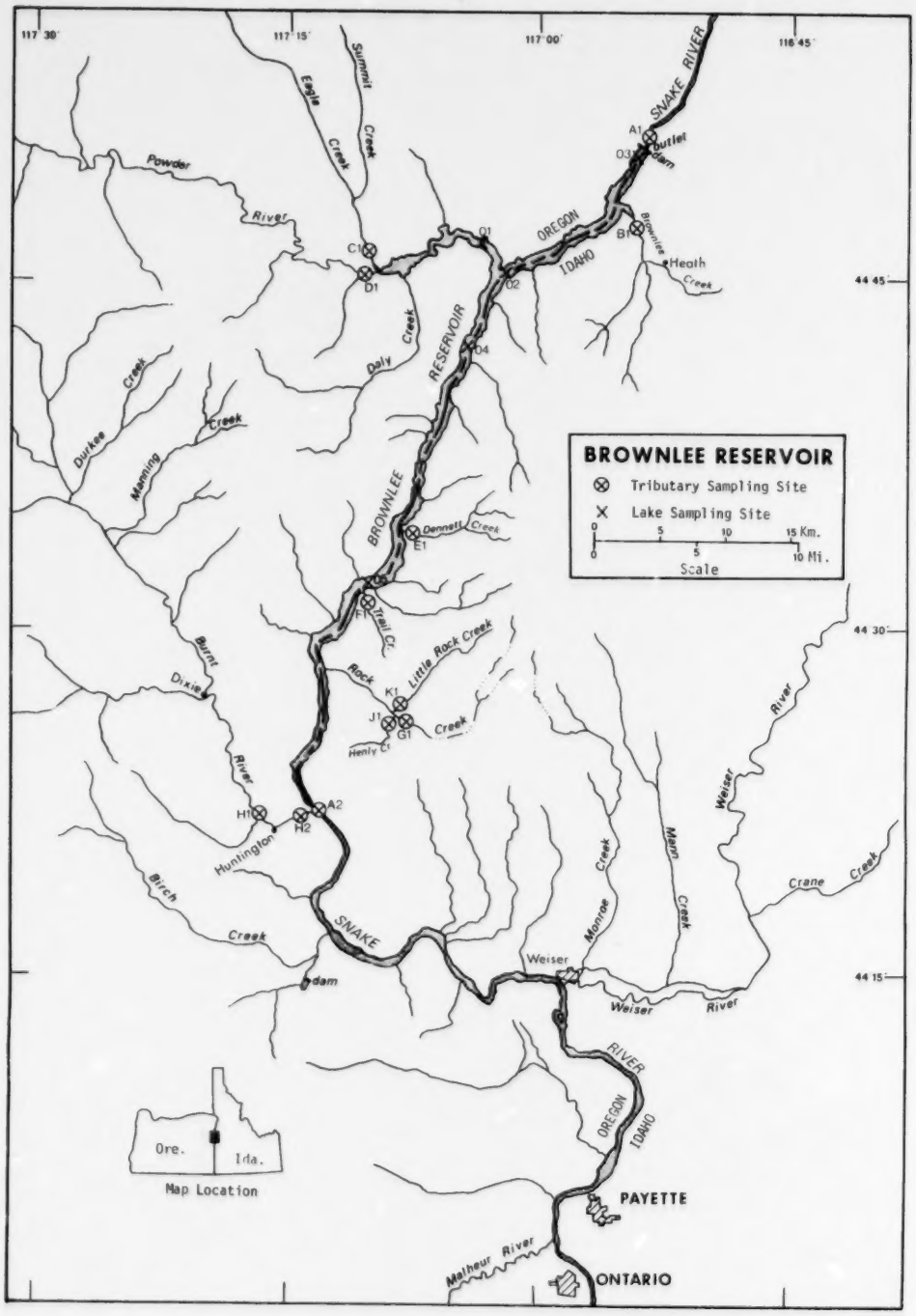
Brigadier General Richard A. Miller, the Adjutant General of Oregon, and Project Officer Lt. Colonel John Mewha, who directed the volunteer efforts of the Oregon National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES and RESERVOIRS

STATE OF OREGON

NAME	COUNTY
Brownlee	Baker, OR; Washington, ID
Diamond	Douglas
Hells Canyon	Baker, Wallowa, OR; Adams, Idaho, ID
Hills Creek	Lane
Owyhee	Malhuer
Oxbow	Baker, OR; Adams, ID
Suttle	Jefferson
Waldo	Lane


BROWNLEE RESERVOIR
Tributary Sampling Site
Lake Sampling Site
0 5 10 15 Km.
0 5 10 Mi.
Scale
117°30'
117°15'
117°00'
116°45'
44°45'
44°30'
44°15'
SNAKE RIVER
Outlet
Dam
OREGON
IDAHO
Brownlee
Heath
Creek
Summit
Eagle
Creek
Powder
River
Daly
Creek
RESERVOIR
BROWNLEE
Durkee
Creek
Manning
Creek
Dennett Creek
Trail Cr.
Little Rock Creek
Rock
Creek
Henly Cr.
Burnt
Dixie
River
Huntington
Birch
Creek
SNAKE
dam
Weiser
Monroe
Creek
Mann
Creek
Weiser
River
Crane
Creek
Weiser
River
RIVER
OREGON
IDAHO
PAYETTE
Malheur River
ONTARIO
Ore.
Ida.
Map Location

BROWNLEE RESERVOIR

STORET NO. 4101

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate Brownlee Reservoir is eutrophic. It ranked twentieth in overall trophic quality when the 21 Oregon and Idaho lakes and reservoirs sampled in 1975 were compared using a combination of six water quality parameters*. Eighteen of the water bodies had less median total phosphorus, dissolved orthophosphorus, and inorganic nitrogen; 17 had less mean chlorophyll a; and 15 had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at sampling stations 2, 3, and 4 in August and at stations 2 and 3 in September, and depletion occurred during a previous study of the reservoir (Ebel and Koski, 1968).

Survey limnologists reported surface concentrations of algae at station 1 in September. The concentrations of chlorophyll a at stations 2, 3, 4, and 5 in April (see page 7) indicate possible bloom conditions at that time as well.

B. Rate-Limiting Nutrient:

The algal assay results are not considered representative of conditions in the reservoir at the time the samples were collected (04/19/75 and 09/15/75) due to significant nutrient changes during shipment of the samples from the field to the laboratory.

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* See Appendix A.

The reservoir data indicate phosphorus limitation at four of the five sampling stations in April, nitrogen limitation at four of the stations in August, and nitrogen limitation at all stations in September.

C. Nutrient Controllability:

1. Point sources--The wastewater treatment plants at Huntington, Oregon, and Weiser, Idaho, collectively contributed an estimated 0.2% of the total phosphorus load to Brownlee Reservoir during the sampling year. However, other municipal and industrial point sources in the drainage basin beyond the 40-kilometer limit of the Survey* probably are significant contributors (see page 10).

The sampling year phosphorus loading of 33.47 g/m^2 is nearly ten times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 14). Although Vollenweider's model may not be applicable to water bodies with short hydraulic retention times, the trophic condition of Brownlee Reservoir is evidence of excessive nutrient loads.

2. Non-point sources--As considered in this report, "non-point" sources include those contributing nutrients as a result of human activities (e.g., agricultural practices, urbanization, extractive processes, etc.) as well as natural sources (i.e., direct precipitation, leaf fall, wild birds and animals, etc.).

The apparent non-point source contribution accounted for 99.8%

* See Working Paper No. 175, "...Survey Methods, 1973-1976".

of the total phosphorus load during the sampling year. However, as noted above, part of this load is attributable to point sources further upstream.

The Snake River contributed 95.3% of the total phosphorus load, the Powder River contributed 2.0%, and four other gaged tributaries collectively contributed 2.2%. The ungaged minor tributaries and immediate drainage contributed an estimated 0.2%.

While substantial point-source inputs occur upstream on the Snake River, in a previous report it is noted that up to 44% of the nutrient load in the river comes from agricultural sources (Anonymous, 1974). Also, in Oregon, agricultural runoff and irrigation return flows have been noted as the major contributors to the nutrient loads in the Burnt, Powder, and Pine rivers (Anonymous, 1969). Any improvement in the trophic condition of Brownlee Reservoir would involve minimization of nutrients from the non-point as well as point sources in the drainage basin.

II. RESERVOIR AND DRAINAGE BASIN CHARACTERISTICS†

A. Morphometry††:

1. Surface area: 56.66 kilometers^2.

2. Mean depth: 31.6 meters.

3. Maximum depth: 84.4 meters.

4. Volume: 1,792.878 x 10^6 m^3.

5. Mean hydraulic retention time: 39 days.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Snake River	180,004.9	507.920
Eagle Creek	507.6	7.670
Powder River	3,548.3	6.980
Rock Creek	42.2	0.075
Burnt River	2,830.9	3.900
Little Rock Creek	31.9	0.041
Minor tributaries & immediate drainage -	1,011.4	8.970
Totals	187,977.2	535.556

2. Outlet -

Snake River	188,033.9**	526.270

C. Precipitation***:

1. Year of sampling: 27.0 centimeters.

2. Mean annual: 27.3 centimeters.

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† Table of metric equivalents--Appendix B.
†† McHugh, 1972.
* For limits of accuracy, see Working Paper No. 175.
** Includes area of reservoir.
*** See Working Paper No. 175.

III. WATER QUALITY SUMMARY

Brownlee Reservoir was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at five stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and last visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths samples were 18.9 meters at station 1, 64.0 meters at station 2 and 3, 32.3 meters at station 4, and 18.6 meters at station 5.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR BROWNLEE RESERVOIR
STORET CODE 4101

PARAMETER	1ST SAMPLING (4/ 9/75) 5 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/ 4/75) 5 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/15/75) 5 SITES RANGE	MEAN	MEDIAN
TEMP (C)	4.6 - 7.0	5.9	6.1	12.1 - 28.1	22.8	24.3	5.6 - 19.0	16.0	17.4
DISS OXY (MG/L)	6.2 - 13.0	11.7	12.2	0.6 - 9.4	5.5	6.0	0.5 - 11.0	5.8	6.0
CNDCTVY (MCROMO)	204. - 308.	238.	243.	171. - 470.	355.	349.	219. - 516.	439.	474.
PH (STAND UNITS)	7.9 - 8.8	8.4	8.5	7.8 - 9.2	8.6	8.8	7.4 - 8.9	8.3	8.4
TOT ALK (MG/L)	120. - 173.	135.	135.	81. - 161.	128.	131.	105. - 171.	150.	156.
TOT P (MG/L)	0.069 - 0.131	0.093	0.084	0.019 - 0.106	0.067	0.074	0.036 - 0.206	0.076	0.067
ORTHO P (MG/L)	0.009 - 0.098	0.043	0.032	0.004 - 0.081	0.046	0.054	0.011 - 0.191	0.055	0.053
NO2+NO3 (MG/L)	0.420 - 0.980	0.559	0.530	0.100 - 0.580	0.360	0.410	0.020 - 0.800	0.491	0.515
AMMONIA (MG/L)	0.020 - 0.390	0.068	0.040	0.020 - 0.260	0.097	0.050	0.020 - 0.740	0.062	0.020
KJEL N (MG/L)	0.200 - 0.600	0.403	0.400	0.200 - 0.700	0.414	0.400	0.200 - 1.000	0.343	0.300
INORG N (MG/L)	0.440 - 1.150	0.627	0.585	0.140 - 0.680	0.458	0.500	0.100 - 0.910	0.553	0.560
TOTAL N (MG/L)	0.630 - 1.380	0.962	0.935	0.420 - 1.160	0.774	0.740	0.470 - 1.260	0.834	0.845
CHLRPYL A (UG/L)	4.7 - 35.0	25.8	31.4	8.1 - 15.5	10.2	9.2	3.3 - 18.7	12.6	12.5
SECCHI (METERS)	0.6 - 0.9	0.7	0.7	1.5 - 3.4	2.6	3.0	0.8 - 3.7	2.2	2.4

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
04/09/75	1. *Stephanodiscus sp.*	9,749
	2. *Asterionella sp.*	603
	3. *Surirella sp.*	235
	4. *Navicula sp.*	168
	5. *Melosira sp.*	101
	Other genera	267
	Total	11,123
08/04/75	1. *Fragilaria sp.*	1,312
	2. *Melosira sp.*	150
	3. *Chroomonas* (?) *sp.*	150
	4. *Cryptomonas sp.*	37
	Total	1,649
09/15/75	1. *Melosira sp.*	2,705
	2. *Aphanizomenon sp.*	312
	3. *Schroederia sp.*	35
	4. *Navicula sp.*	35
	Total	3,087

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (μg/l)
04/09/75	1	4.7
	2	31.4
	3	23.1
	4	35.0
	5	34.9
08/04/75	1	8.1
	2	9.2
	3	8.8
	4	9.4
	5	15.5
09/15/75	1	18.7
	2	16.0
	3	12.5
	4	12.5
	5	3.3

C. Limiting Nutrient Study:

The algal assay results are not considered representative of conditions in the reservoir at the time the samples were taken (04/09/75 and 09/15/75) due to significant nutrient changes in the samples during shipment from the field to the laboratory.

The reservoir data indicate a combination of limiting nutrients. Following is a tabulation of the mean inorganic nitrogen/orthophosphorus ratios for each of the sampling stations and times with the indicated limiting nutrient in parentheses.

Station	04/09/75	08/04/75	09/15/75
1	6/1 (N)	16/1 (P)	12/1 (N)
2	19/1 (P)	9/1 (N)	7/1 (N)
3	19/1 (P)	10/1 (N)	10/1 (N)
4	26/1 (P)	10/1 (N)	13/1 (N-?)
5	17/1 (P)	9/1 (N)	12/1 (N)

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Oregon National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of January and February when two samples were collected. Sampling was begun in October, 1974. and was completed in September, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Oregon District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations G-1 and K-1 and multiplying the means by the ZZ area in km^2.

The operators of the Huntington, OR and Weiser, ID wastewater treatment plants did not participate; nutrient loads from these sources were estimated at 1.134 kg P and 3.401 kg N/capita/year, and flows were estimated at 0.3785 m^3/capita/day.

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* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Huntington	689	act. sludge	260.8	Burnt River
Weiser	4,000	prim. clarifier	1,514.0	Snake River

In addition, there are at least 27 other municipal wastewater treatment facilities beyond the 40-kilometer Survey limit**. These facilities collectively serve 228,880 people and discharge 196,435 m^3/day. Except for the plants at Vale, Ontario, and Baker, Oregon, most of these plants discharge into the Snake River and its tributaries in Idaho.

2. Known industrial†--At least 31 industries are known to discharge within the drainage basin in Oregon and Idaho. These include sugar-beet, potato, and other agricultural processing plants; fish hatcheries; car washes; timber processing; a phosphate reduction plant; and a cement plant.

* Anonymous, 1971.
** See Working Paper No. 175.
† Anonymous, 1969; 1974.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Snake River	1,807,140	95.3
Eagle Creek	14,930	0.8
Powder River	37,285	2.0
Rock Creek	220	< 0.1
Burnt River	25,715	1.4
Little Rock Creek	120	< 0.1
b. Minor tributaries & immediate drainage (non-point load) -	4,550	0.2
c. Known municipal STP's -		
Huntington, OR	780	< 0.1
Weiser, ID	4,535	0.2
d. Septic tanks - Unknown	?	-
e. Industrial - Unknown	?	-
f. Direct precipitation* -	990	0.1
Total	1,896,265	100.0

2. Outputs -

Reservoir outlet - Snake River 1,023,210

3. Net annual P accumulation - 873,055 kg.

* See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Snake River	30,295,705	97.4
Eagle Creek	173,010	0.6
Powder River	331,525	1.1
Rock Creek	2,275	< 0.1
Burnt River	153,350	0.5
Little Rock Creek	1,460	< 0.1
b. Minor tributaries & immediate drainage (non-point load) -	50,570	0.2
c. Known municipal STP's -		
Huntington, OR	2,345	< 0.1
Weiser, ID	13,605	< 0.1
d. Septic tanks - Unknown	?	-
e. Industrial - Unknown	?	-
f. Direct precipitation* -	61,170	0.2
Total	31,085,015	100.0

2. Outputs -

Reservoir outlet - Snake River 18,218,785

3. Net annual N accumulation - 12,866,230 kg.

* See Working Paper No. 175.

D. Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Snake River	10	168
Eagle Creek	29	341
Powder River	11	93
Rock Creek	5	54
Burnt River	9	54
Little Rock Creek	4	46

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P Conc. (mg/l)	Mean Total N Conc. (mg/l)
Brownlee Creek	0.065	0.883
Dennett Creek	0.031	1.274
Trail Creek	0.097	0.928
Henley Creek	0.110	0.548

F. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	33.47	15.41	548.6	227.1

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Brownlee Reservoir:

"Dangerous" (eutrophic loading)	3.40
"Permissible" (oligotrophic loading)	1.70

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

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LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1601	AMERICAN FALLS RESERVOIR	0.105	0.080	463.800	15.379	14.700	0.035
1602	CASCADE LAKE	0.032	0.060	415.067	8.081	14.800	0.009
1603	LAKE COEUR D'ALENE	0.017	0.040	380.348	10.391	12.200	0.005
1604	DWORSHAK RESERVOIR	0.010	0.080	401.866	2.420	7.400	0.009
1605	HAUSER	0.028	0.075	366.286	11.112	14.800	0.013
1606	HAYDEN LAKE	0.010	0.040	243.500	2.787	11.800	0.003
1607	ISLAND PARK RESERVOIR	0.034	0.050	391.778	9.322	12.800	0.012
1608	LAKE LOWELL	0.070	0.070	477.111	25.389	14.600	0.015
1609	MAGIC RESERVOIR	0.062	0.130	400.750	7.322	14.700	0.020
1610	PALISADES RESERVOIR	0.024	0.080	345.428	2.067	12.800	0.007
1611	LOWER PAYETTE	0.013	0.060	234.000	4.600	9.600	0.007
1612	LOWER TWIN LAKES	0.016	0.050	370.000	2.318	13.600	0.009
1613	UPPER TWIN LAKES	0.017	0.045	369.143	34.962	8.200	0.004
4101	BROWNLEE RESERVOIR	0.079	0.560	428.133	16.207	14.500	0.043
4102	DIAMOND LAKE	0.028	0.040	294.500	7.300	6.800	0.011
4103	HELLS CANYON RESERVOIR	0.068	0.640	429.111	18.722	12.400	0.045
4104	HILLS CREEK RESERVOIR	0.038	0.060	435.200	2.333	7.400	0.027
4105	OWYHEE	0.095	0.425	480.417	3.350	13.200	0.064
4106	OXBOW RESERVOIR	0.071	0.690	425.555	10.311	12.200	0.040
4107	SUTTLE LAKE	0.031	0.040	95.000	9.167	6.800	0.020
4108	WALDO LAKE	0.005	0.040	-100.000	0.350	6.800	0.006

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1601	AMERICAN FALLS RESERVOIR	0 (0)	30 (5)	10 (2)	20 (4)	13 (2)	20 (4)	93
1602	CASCADE LAKE	45 (9)	58 (11)	35 (7)	50 (10)	3 (0)	65 (12)	256
1603	LAKE COEUR D'ALENE	75 (15)	93 (17)	55 (11)	30 (6)	58 (11)	90 (18)	401
1604	DWORSHAK RESERVOIR	93 (18)	30 (5)	40 (8)	80 (16)	83 (16)	65 (12)	391
1605	HAUSER	58 (11)	40 (8)	70 (14)	25 (5)	3 (0)	45 (9)	241
1606	HAYDEN LAKE	93 (18)	93 (17)	85 (17)	75 (15)	65 (13)	100 (20)	511
1607	ISLAND PARK RESERVOIR	40 (8)	68 (13)	50 (10)	40 (8)	43 (8)	50 (10)	291
1608	LAKE LOWELL	20 (4)	45 (9)	5 (1)	5 (1)	20 (4)	40 (8)	135
1609	MAGIC RESERVOIR	30 (6)	20 (4)	45 (9)	55 (11)	13 (2)	30 (6)	193
1610	PALISADES RESERVOIR	65 (13)	30 (5)	75 (15)	95 (19)	43 (8)	80 (16)	388
1611	LOWER PAYETTE	85 (17)	58 (11)	90 (18)	65 (13)	70 (14)	75 (15)	443
1612	LOWER TWIN LAKES	80 (16)	68 (13)	60 (12)	90 (18)	30 (6)	65 (12)	393
1613	UPPER TWIN LAKES	70 (14)	75 (15)	65 (13)	0 (0)	75 (15)	95 (19)	380
4101	BROWNLEE RESERVOIR	10 (2)	10 (2)	25 (5)	15 (3)	25 (5)	10 (2)	95
4102	DIAMOND LAKE	58 (11)	93 (17)	80 (16)	60 (12)	95 (18)	55 (11)	441
4103	HELLS CANYON RESERVOIR	25 (5)	5 (1)	20 (4)	10 (2)	50 (10)	5 (1)	115
4104	HILLS CREEK RESERVOIR	35 (7)	50 (10)	15 (3)	85 (17)	83 (16)	25 (5)	293
4105	OWYHEE	5 (1)	15 (3)	0 (0)	70 (14)	35 (7)	0 (0)	125
4106	OXBOW RESERVOIR	15 (3)	0 (0)	30 (6)	35 (7)	58 (11)	15 (3)	153
4107	SUTTLE LAKE	50 (10)	80 (16)	95 (19)	45 (9)	95 (18)	35 (7)	400
4108	WALDO LAKE	100 (20)	93 (17)	100 (20)	100 (20)	95 (18)	85 (17)	573

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	4108	WALDO LAKE	573
2	1606	HAYDEN LAKE	511
3	1611	LOWER PAYETTE	443
4	4102	DIAMOND LAKE	441
5	1603	LAKE COEUR D'ALENE	401
6	4107	SUTTLE LAKE	400
7	1612	LOWER TWIN LAKES	393
8	1604	DWORSHAK RESERVOIR	391
9	1610	PALISADES RESERVOIR	388
10	1613	UPPER TWIN LAKES	380
11	4104	HILLS CREEK RESERVOIR	293
12	1607	ISLAND PARK RESERVOIR	291
13	1602	CASCADE LAKE	256
14	1605	HAUSER	241
15	1609	MAGIC RESERVOIR	193
16	4106	OXBOW RESERVOIR	153
17	1608	LAKE LOWELL	135
18	4105	OWYHEE	125
19	4103	HELLS CANYON RESERVOIR	115
20	4101	BROWNLEE RESERVOIR	95
21	1601	AMERICAN FALLS RESERVOIR	93

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 - cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR OREGON 08/11/76

LAKE CODE 4101 BROWNLEE RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 188033.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4101A1	188033.9	594.65	710.75	671.11	707.92	614.48	600.32	331.31	322.81	396.44	444.57	441.74	498.38	526.27
4101A2	180004.9	515.37	600.32	611.64	690.93	696.59	656.95	328.48	317.15	379.45	430.42	427.58	453.07	507.92
4101C1	507.6	3.40	3.96	4.53	12.18	24.92	28.32	6.80	1.13	0.28	0.85	1.98	3.68	7.67
4101D1	3548.3	7.08	11.33	13.88	16.42	13.03	11.33	1.98	1.13	1.27	1.70	1.98	3.11	6.98
4101G1	42.2	0.024	0.085	0.142	0.340	0.170	0.057	0.018	0.014	0.017	0.014	0.011	0.013	0.075
4101H1	2830.9	2.43	4.87	6.34	10.56	7.50	4.08	2.08	1.81	2.05	1.85	1.65	1.74	3.90
4101K1	31.9	0.018	0.048	0.071	0.156	0.085	0.042	0.014	0.011	0.014	0.013	0.010	0.011	0.041
4101Z7	1080.0	5.66	6.80	9.20	10.76	32.85	19.26	9.20	2.83	2.27	2.69	2.83	3.11	8.97

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 188033.9
SUM OF SUB-DRAINAGE AREAS = 188045.6

TOTAL FLOW IN = 6439.86
TOTAL FLOW OUT = 6334.47

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4101A1	10	74	498.376	19	410.594				
	11	74	492.713	22	475.723				
	12	74	523.862	14	538.020				
	1	75	614.476	4	617.307	25	656.951		
	2	75	719.248	24	778.713				
	3	75	872.159	9	889.149				
	4	75	1260.100	13	1149.664				
	5	75	1328.060	17	51.537	21	1427.169		
	6	75	719.248	10	671.109				
	7	75	407.762	28	314.317				
	8	75	325.644	9	308.654	29	288.832		
	9	75	444.574	16	501.208				
4101A2	10	74	458.733	20	436.079				
	11	74	478.555	22	489.881				
	12	74	515.366	14	518.198				
	1	75	543.683	4	521.030	24	549.347		
	2	75	583.327	9	549.347	22	529.525		
	3	75	790.040	9	906.139				
	4	75	1166.654	12	968.436				
	5	75	1305.406	17	1512.120				
	6	75	883.486	8	1124.179				
	7	75	370.951	19	342.634				
	8	75	325.644	29	334.139				
	9	75	382.277	27	410.594				

TRIBUTARY FLOW INFORMATION FOR OREGON 08/11/76

LAKE CODE 4101 BROWNLEE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4101C1	10	74	0.170	19	0.170				
	11	74	1.416	23	1.416				
	12	74	2.690	14	2.690				
	1	75	2.690	3	2.549	25	2.832		
	2	75	2.690	9	2.605	22	2.690		
	3	75	3.681	9	3.681				
	4	75	5.947	12	3.964	13	5.097		
	5	75	22.653	17	40.210				
	6	75	39.644	7	50.970				
	7	75	25.202	20	13.309				
	8	75	3.115	9	3.115	29	2.265		
	9	75	0.708						
4101D1	10	74	3.256	19	3.398				
	11	74	1.841	23	1.699				
	12	74	2.124	14	1.841				
	1	75	2.265	3	1.699	25	2.832		
	2	75	5.239	9	5.239	22	4.672		
	3	75	22.653	9	46.723				
	4	75	20.388	12	14.158	13	16.990		
	5	75	33.980	17	46.723				
	6	75	24.636	7	28.883				
	7	75	7.646	20	2.832				
	8	75	1.699	9	0.850	29	1.133		
	9	75	1.982	28	2.549				
4101G1	10	74	0.013	20	0.025				
	11	74	0.011	22	0.017				
	12	74	0.013	14	0.042				
	1	75	0.015	4	0.014				
	2	75	0.037						
	3	75	0.269						
	4	75	0.510						
	5	75	1.416	17	0.991				
	6	75	0.142	8	0.170				
	7	75	0.057	19	0.113				
	8	75	0.034	9	0.042				
	9	75	0.037	27	0.071				
4101H1	10	74	1.727	20	1.557				
	11	74	1.586	22	1.501				
	12	74	1.671	14	1.727				
	1	75	1.897	4	1.472	24	2.407		
	2	75	3.143	9	2.775	22	2.690		
	3	75	9.345						
	4	75	13.451	12	9.628				
	5	75	23.616	17	32.564				
	6	75	6.485	8	6.570				
	7	75	3.766	19	4.191				
	8	75	2.945	9	2.407				
	9	75	3.143	27	3.568				

TRIBUTARY FLOW INFORMATION FOR OREGON 08/11/76

LAKE CODE 4101 BROWNLEE RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4101K1	10	74	0.011	20	0.023				
	11	74	0.010	22	0.014				
	12	74	0.011	14	0.034				
	1	75	0.013						
	2	75	0.025						
	3	75	0.127						
	4	75	0.198						
	5	75	0.453	17	0.368				
	6	75	0.071	8	0.085				
	7	75	0.034	19	0.065				
	8	75	0.024	9	0.028				
	9	75	0.025	27	0.057				

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/08/12

410101
44 46 05.0 117 03 30.0 3
BROWNLEE RESERVOIR
41001 OREGON
130891

11EPALES 2111202
0066 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/09	10 00	0000	5.3	11.8	26	204	8.00	134	0.040	0.400	0.520	0.091
	10 00	0005	5.3	11.6		205	8.00	136	0.040	0.400	0.530	0.090
	10 00	0015	5.3	12.0		205	8.00	135	0.040	0.400	0.540	0.093
	10 00	0025	5.3	11.4		205	7.95	137	0.040	0.400	0.530	0.083
	10 00	0050	4.8	11.9		204	8.00	137	0.050	0.400	0.540	0.091
	10 00	0062	4.6	11.6		204	8.00	139	0.060	0.400	0.550	0.098
75/08/04	13 35	0000	24.7	9.4	120	345	9.00	127	0.050	0.400	0.210	0.013
	13 35	0005	24.4	8.2		345	8.95	127	0.050	0.300	0.240	0.017
	13 35	0020	24.2	7.4		349	8.80	131	0.050	0.300	0.260	0.023
	13 35	0036	23.9	7.0		340	8.95	131	0.050	0.300	0.290	0.022
75/09/15	12 40	0000	18.5	10.6	30	412	8.80	153	0.020	0.300	0.370	0.020
	12 40	0005	18.2	11.0		407	8.95	143	0.030	0.400	0.070	0.013
	12 40	0015	17.6	8.2		414	8.40	149	0.020	0.300	0.310	0.028
	12 40	0056	16.8	4.6		437	8.55	157	0.020K	0.300	0.410	0.042

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/09	10 00	0000	0.123	4.7	
	10 00	0005	0.119		
	10 00	0015	0.121		
	10 00	0025	0.121		
	10 00	0050	0.127		
	10 00	0062	0.131		
75/08/04	13 35	0000	0.033	8.1	
	13 35	0005	0.034		
	13 35	0020	0.035		
	13 35	0036	0.036		
75/09/15	12 40	0000	0.062	18.7	
	12 40	0005	0.066		
	12 40	0015	0.056		
	12 40	0056	0.068		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

410102
44 44 45.0 117 02 25.0 3
BROWNLEE RESERVOIR
41001 OREGON
130892

11EPALES 2111202
0181 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/09	10 25	0000	6.3	12.8	26	242	8.60	132	0.040	0.500	0.520	0.018
	10 25	0005	6.3	12.4		243	8.60	131	0.040	0.400	0.510	0.032
	10 25	0015	6.4	12.2		244	8.60	131	0.040	0.400	0.510	0.019
	10 25	0025	6.3	12.0		244	8.55	130	0.390	0.400	0.500	0.028
	10 25	0050	6.3	12.2		244	8.50	130	0.040	0.400	0.510	0.023
	10 25	0100	6.3	11.8		244	8.50	132	0.060	0.400	0.530	0.024
	10 25	0125	6.1	11.4		246	8.15	134	0.070	0.400	0.560	0.043
	10 25	0143	5.1	11.2		225	8.30	140	0.080	0.400	0.600	0.067
	10 25	0160	5.1	10.6		254	8.10	144	0.120	0.400	0.680	0.057
	10 25	0177	5.0	9.8		265	8.15	145	0.180	0.400	0.680	0.051
75/08/04	12 15	0000	24.9	8.6	120	366	8.95	129	0.050	0.400	0.240	0.016
	12 15	0005	24.2	7.8		369	8.80	136	0.070	0.400	0.360	0.033
	12 15	0020	24.3	5.4		363	8.50	132	0.050	0.300	0.360	0.036
	12 15	0065	23.2	2.2		309	8.15	122	0.030	0.200	0.580	0.066
	12 15	0120	16.9	0.8		264	7.95	112	0.130	0.300	0.420	0.081
	12 15	0170	12.1	0.6		197	7.85	95	0.150	0.400	0.380	0.081
75/09/15	13 15	0000	18.3	11.0	60	459	8.95	145	0.030	0.400	0.180	0.011
	13 15	0005	18.2	10.8		454	8.90	148	0.020	0.400	0.260	0.013
	13 15	0022	17.6	6.5		460	8.40	157	0.020	0.400	0.590	0.045
	13 15	0050	17.3	5.4		493	8.25	161	0.020	0.300	0.700	0.059
	13 15	0085	16.6	3.3		505	8.10	164	0.020	0.300	0.770	0.071
	13 15	0120	15.2	1.1		466	7.80	159	0.150	0.500	0.760	0.094
	13 15	0160	8.8	0.5		219	7.55	105	0.040	0.600	0.190	0.129
	13 15	0210	5.9	0.6		268	7.50	131	0.740	1.000	0.020K	0.191

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

410102
44 44 45.0 117 02 25.0 3
BROWNLEE RESERVOIR
41001 OREGON
130892

11EPALES 2111202
0161 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/09	10 25	0000	0.075	31.4	
	10 25	0005	0.078		
	10 25	0015	0.074		
	10 25	0025	0.081		
	10 25	0050	0.084		
	10 25	0100	0.081		
	10 25	0125	0.087		
	10 25	0143	0.120		
	10 25	0160	0.098		
	10 25	0177	0.105		
75/08/04	12 15	0000	0.035	9.2	
	12 15	0005	0.053		
	12 15	0020	0.050		
	12 15	0065	0.074		
	12 15	0120	0.088		
	12 15	0170	0.095		
75/09/15	13 15	0000	0.065	16.0	
	13 15	0005	0.044		
	13 15	0022	0.067		
	13 15	0050	0.074		
	13 15	0085	0.090		
	13 15	0120	0.117		
	13 15	0160	0.156		
	13 15	0210	0.206		

STORET RETRIEVAL DATE 76/08/12

410103
44 49 55.0 116 54 22.0 3
BROWNLEE RESERVOIR
41001 OREGON
130892

11EPALES 2111202
0999 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/09	11 00	0000	6.4	12.8	36	254	8.60	141	0.040	0.400	0.600	0.030
	11 00	0005	6.4	12.6		254	8.60	140	0.030	0.300	0.600	0.031
	11 00	0015	6.4	12.4		254	8.55	138	0.040	0.300	0.600	0.038
	11 00	0025	6.4	12.2		254	8.55	137	0.040	0.400	0.600	0.024
	11 00	0050	6.3	12.2		254	8.50	137	0.040	0.400	0.610	0.032
	11 00	0100	5.8	11.2		255	8.40	139	0.070	0.400	0.670	0.029
	11 00	0125	5.1	11.0		254	8.20	140	0.080	0.400	0.730	0.047
	11 00	0150	4.9	9.8		258	8.10	143	0.110	0.300	0.770	0.065
	11 00	0175	4.7	7.2		289	7.95	159	0.140	0.400	0.890	0.059
	11 00	0210	4.7	6.2		308	8.00	173	0.170	0.400	0.980	0.064
75/08/04	11 20	0000	25.8	5.6	132	339	8.80	107	0.030	0.300	0.120	0.011
	11 20	0005	25.8	8.6		337	9.20	109	0.040	0.400	0.100	0.005
	11 20	0015	25.5	7.0		333	9.05	113	0.040	0.400	0.110	0.004
	11 20	0045	24.1	5.6		341	8.70	117	0.040	0.300	0.310	0.024
	11 20	0070	22.4	3.4		295	8.30	106	0.030	0.300	0.370	0.041
	11 20	0100	17.4	4.4		249	8.20	102	0.030	0.300	0.420	0.043
	11 20	0135	14.7	2.6		171	8.00	81	0.020	0.300	0.320	0.054
	11 20	0175	12.3	0.8		205	7.80	97	0.040	0.400	0.480	0.064
75/09/15	12 10	0000	19.0	9.8	96	482	8.70	151	0.020K	0.200	0.360	0.011
	12 10	0005	18.8	9.7		473	8.70	152	0.020K	0.200	0.360	0.017
	12 10	0033	17.4	3.0		489	7.95	158	0.020K	0.200	0.750	0.070
	12 10	0080	16.5	0.8		474	7.80	158	0.020K	0.200	0.800	0.084
	12 10	0130	14.3	0.8		354	7.50	110	0.020K	0.200K	0.500	0.081
	12 10	0160	8.8	0.8		228	7.40	109	0.130	0.200	0.410	0.093
	12 10	0210	5.6	2.0		262	8.70	151	0.030	0.200	0.370	0.022

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

410103
44 49 55.0 116 54 22.0 3
BROWNLEE RESERVOIR
41001 OREGON
130892

11EPALES 2111202
0999 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/09	11 00	0000	0.080	23.1	
	11 00	0005	0.073		
	11 00	0015	0.073		
	11 00	0025	0.072		
	11 00	0050	0.075		
	11 00	0100	0.084		
	11 00	0125	0.084		
	11 00	0150	0.094		
	11 00	0175	0.088		
	11 00	0210	0.094		
75/08/04	11 20	0000	0.059	8.8	
	11 20	0005	0.027		
	11 20	0015	0.019		
	11 20	0045	0.034		
	11 20	0070	0.055		
	11 20	0100	0.053		
	11 20	0135	0.068		
	11 20	0175	0.085		
75/09/15	12 10	0000	0.036	12.5	
	12 10	0005	0.038		
	12 10	0033	0.091		
	12 10	0080	0.095		
	12 10	0130	0.078		
	12 10	0160	0.105		
	12 10	0210	0.035		

STORET RETRIEVAL DATE 76/08/12

410104
44 41 10.0 117 04 50.0 3
BROWNLEE RESERVOIR
41001 OREGON
130892

11EPALES 2111202
0102 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/09	12 45	0000	7.0	13.0	24	213	8.80	121	0.030	0.500	0.430	0.009
	12 45	0005	6.8	13.0		213	8.70	121	0.030	0.400	0.420	0.019
	12 45	0015	6.9	12.6		215	8.70	120	0.050	0.300	0.430	0.021
	12 45	0055	6.9	12.6		215	8.70	120	0.040	0.400	0.430	0.027
	12 45	0098	6.8	12.6		237	8.70	123	0.040	0.200	0.430	0.013
75/08/04	14 45	0000	25.5	9.0	84	433	8.70	131	0.090	0.500	0.410	0.044
	14 45	0005	25.0	6.6		421	8.75	144	0.130	0.600	0.490	0.066
	14 45	0015	24.7	6.0		423	8.70	145	0.140	0.500	0.490	0.065
	14 45	0040	24.6	5.6		423	8.70	145	0.170	0.500	0.480	0.065
	14 45	0070	23.4	3.2		438	8.40	153	0.240	0.600	0.410	0.067
	14 45	0094	20.9	1.4		354	8.20	132	0.260	0.700	0.420	0.076
75/09/15	14 40	0000	18.0	8.8	96	483	8.75	155	0.020	0.400	0.440	0.032
	14 40	0005	18.0	9.2		496	8.60	158	0.020K	0.300	0.530	0.038
	14 40	0026	17.5	6.2		494	8.40	163	0.030	0.300	0.650	0.052
	14 40	0060	17.2	5.4		503	8.30	171	0.080	0.400	0.690	0.061
	14 40	0106	15.9	4.4		511	8.50	166	0.020K	0.300	0.750	0.055

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/09	12 45	0000	0.069	35.0	
	12 45	0005	0.078		
	12 45	0015	0.080		
	12 45	0055	0.083		
	12 45	0098	0.077		
75/08/04	14 45	0000	0.079	9.4	
	14 45	0005	0.093		
	14 45	0015	0.088		
	14 45	0040	0.083		
	14 45	0070	0.090		
	14 45	0094	0.104		
75/09/15	14 40	0000	0.057	12.5	
	14 40	0005	0.059		
	14 40	0026	0.070		
	14 40	0060	0.075		
	14 40	0106	0.062		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

410105
44 31 25.0 117 10 30.0 3
BROWNLEE RESERVOIR
41001 OREGON

130892

11EPALES 2111202
0050 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/04/09	13 00	0000	6.1	12.6	24	235	8.75	129	0.040	0.500	0.440	0.013
	13 00	0005	6.1	12.6		236	8.75	128	0.030	0.400	0.420	0.023
	13 00	0015	6.0	12.8		236	8.75	127	0.020	0.500	0.420	0.020
	13 00	0025	5.9	12.4		234	8.75	126	0.030	0.600	0.420	0.040
	13 00	0045	5.9	12.6		235	8.80	129	0.040	0.500	0.430	0.037
75/08/04	15 45	0000	28.1	6.2	60	470	8.95	152	0.100	0.700	0.460	0.064
	15 45	0005	25.7	9.0		455	9.05	155	0.110	0.700	0.450	0.062
	15 45	0010	24.9	6.0		450	8.80	156	0.170	0.300	0.440	0.064
	15 45	0035	24.5	5.6		460	8.85	158	0.220	0.400	0.420	0.064
	15 45	0061	23.4	6.4		445	8.90	161	0.240	0.500	0.410	0.065
75/09/15	15 10	0000	18.6	8.2	144	516	8.60	154	0.020K	0.300	0.550	0.036
	15 10	0005	18.4	6.4		515	8.40	157	0.050	0.300	0.650	0.062
	15 10	0020	17.9	6.6		508	8.35	157	0.050	0.400	0.660	0.061
	15 10	0036	17.4	5.8		508	8.35	158	0.050	0.300	0.660	0.057

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/04/09	13 00	0000	0.085	34.9	
	13 00	0005	0.095		
	13 00	0015	0.096		
	13 00	0025	0.109		
	13 00	0045	0.117		
75/08/04	15 45	0000	0.099	15.5	
	15 45	0005	0.106		
	15 45	0010	0.087		
	15 45	0035	0.087		
	15 45	0061	0.098		
75/09/15	15 10	0000	0.048	3.3	
	15 10	0005	0.067		
	15 10	0020	0.068		
	15 10	0036	0.058		

K VALUE KNOWN TO BE
LESS THAN INDICATED

APPENDIX E

TRIBUTARY DATA

STORET RETRIEVAL DATE 76/08/12

4101A1
44 50 40.0 116 53 50.0 4
SNAKE RIVER
41 15 COPPERFIELD
O/BROWNLEE RESERVOIR 130892
BAKER HMSTEAD HWY BRDG .6 MI DWNSTRM DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	16	00	0.780	0.400	0.065	0.057	0.070
74/11/22	18	36	0.960	0.700	0.090	0.045	0.050
74/12/14	13	30	1.000	0.700	0.075	0.045	0.050
75/01/04	11	15	1.000	1.000	0.065	0.045	0.050
75/01/25	11	12	0.830	0.300	0.032	0.016	0.050
75/02/24	11	38	0.016	0.500	0.032	0.028	0.040
75/03/09	11	00	0.800	1.350	0.032	0.080	
75/04/13	10	55	0.480	1.750	0.065	0.020	0.070
75/05/17	15	30	0.175	1.100	0.025	0.130	0.380
75/05/21	13	30	0.010	0.200	0.020	0.035	0.040
75/06/10			0.012	0.100	0.025	0.125	
75/07/28	11	45	0.015	0.300	0.010	0.025	0.040
75/08/09	09	00	0.310	0.775	0.040	0.030	0.150
75/08/29	11	25	0.060	0.150	0.015	0.025	0.030
75/09/16	15	55	0.055	0.300	0.005K	0.005	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4101A2
44 21 50.0 117 13 10.0 4
SNAKE RIVER
41 15 OLDS FERRY
T/BROWNLEE RESERVOIR 130792
RR BRDG 3 MI N OF ROCK ISLAND
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	12 40		0.880	0.600	0.020	0.020	0.060
74/11/22	11 00		1.060	0.700	0.045	0.020	0.060
74/12/14	10 20		1.060	0.500	0.014	0.035	0.050
75/01/04	10 00		0.890	2.800	0.060	0.055	0.190
75/01/24	10 00		0.760	0.500	0.032	0.032	0.070
75/02/09	10 30		0.820	1.000	0.024	0.032	0.100
75/02/22	10 40		0.960	1.000	0.043	0.068	0.190
75/03/09	09 50		0.583	3.000	0.088	0.184	
75/04/12	09 59		0.390	1.100	0.085	0.020	0.130
75/05/17	14 30		0.175	1.250	0.125	0.135	0.390
	15 00		0.130	0.900	0.040	0.030	0.170
75/06/08	14 30		0.095	2.200	0.037	0.020	0.100
75/07/19	11 00		0.690	0.450	0.035	0.075	0.130
75/08/29	10 50		0.005		0.010	0.035	0.050
75/09/27	09 20		0.490	0.950	0.020	0.010	0.120

STORET RETRIEVAL DATE 76/08/12

410181
44 47 00.0 116 54 30.0 4
BROWNLEE CREEK
41 15 COPPERFIELD
T/BROWNLEE RESERVOIR 130892
BNK NEAR HWY 71 4.5 MI S OF DAM
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	16	20	0.064	0.100K	0.015	0.025	0.035
74/11/22	18	00	0.032	0.300	0.035	0.025	0.030
74/12/14	12	40	0.088	0.300	0.005	0.010	0.020
75/01/04	10	30	0.200	0.700	0.010		0.032
75/01/25	10	37	0.176	1.700	0.016	0.040	0.070
75/02/09	10	45	0.240	0.400	0.016	0.032	0.040
75/02/22	11	40	0.369	0.100K	0.012	0.040	0.050
75/03/09	11	45	0.780	0.800	0.020	0.088	0.210
75/04/13	10	15	0.330	1.700	0.025	0.055	0.120
75/05/17	11	00	0.290	1.450	0.025	0.075	
75/06/07	11	45	0.160	0.350	0.005	0.025	0.100
75/07/20	11	30	0.100	0.100	0.017	0.035	0.040
75/08/29	11	05	0.005		0.010	0.030	0.040
75/09/28			0.150	0.500	0.015	0.030	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4101C1
44 45 45.0 117 10 38.0 4
EAGLE CREEK
41 15 HALFWAY 130891
T/BROWNLEE RESERVOIR
BAKER HMSTEAD HWY BRDG .7 MI SW RICHLAND
2111204
11EPALES
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	10 30		0.024	1.100	0.015	0.015	0.020
74/11/23	09 30		0.024	0.300	0.010	0.005	0.060
74/12/14	10 00		0.056	0.300	0.005K	0.015	0.015
75/01/03	08 00		0.136	0.600	0.010	0.015	0.020
75/01/25	08 45		0.136	0.400		0.016	0.020
75/02/09	09 18		0.120	0.400	0.016	0.008	0.020
75/02/22	13 20		0.180	0.100K	0.016	0.016	0.020
75/03/09	14 05		0.400	0.400	0.016	0.032	0.050
75/04/12	14 14		0.100	1.350	0.108	0.015	0.030
75/04/13	08 15		0.185	0.700	0.020	0.015	0.050
75/05/17	15 30		0.125	0.300	0.052	0.045	0.060
75/06/07	10 00		0.110	0.750	0.010	0.010	0.110
75/07/20	13 05		0.050	0.050	0.010	0.015	0.070
75/08/09			0.020	1.250	0.030	0.025	0.070
75/08/29	10 40		0.010	0.250	0.025	0.045	0.060
75/09/28			0.010	0.900	0.015	0.015	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

410101
44 44 45.0 117 10 20.0 4
POWDER RIVER
41 15 MINERAL
T/BROWNLEE RESERVOIR 130892
SEC RD BRDG 1.8 MI S OF RICHLAND
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/19	11 00		0.016	0.400	0.020	0.090	0.120
74/11/23	09 45		0.008	0.500	0.015	0.065	0.070
74/12/14	10 10		0.016	0.300	0.010	0.065	0.065
75/01/03	08 20		0.224	1.600	0.035	0.075	0.100
75/01/25	15 25		0.128	2.300	0.088	0.016	0.090
75/02/09			0.104	0.400	0.008	0.008	0.020
75/02/22	13 00		0.395	0.800	0.040	0.104	0.140
75/03/09	14 10		0.697	1.500	0.084	0.192	0.400
75/04/12	14 00		0.420	2.400	0.180	0.100	0.180
75/04/13	08 35		0.440	0.850	0.025	0.095	0.200
75/05/17	15 25		0.095	1.250	0.065	0.095	0.190
75/06/07	10 10		0.055	1.500	0.020	0.090	0.150
75/07/20	13 14		0.030	0.500	0.025	0.125	0.160
75/08/09			0.010	0.850	0.025	0.260	0.310
75/08/29	09 55		0.005	0.100	0.015	0.030	0.035
75/09/28			0.010	1.250	0.005	0.110	0.157

STORET RETRIEVAL DATE 76/08/12

4101E1
44 33 45.0 117 07 55.0 4
DENNETT CREEK
41 15 MINERAL
T/BROWNLEE RESERVOIR 130892
BNK NEAR MINERAL RD 2.8 MI W OF MINERAL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	17	00	0.552	0.100K	0.015	0.005K	0.005
74/11/22	15	00	0.448	0.400	0.015	0.005K	0.010
75/01/04	13	10	0.576	1.000	0.010	0.050	0.070
75/05/17	11	15	1.050		0.075	0.065	
75/06/08	12	00	0.700	1.300	0.025	0.015	0.040
75/07/19	14	00	0.650	0.650	0.025	0.005	0.030
75/08/09	12	05	0.690	0.700	0.030	0.010	0.040
75/09/28	12	25	0.550	0.600	0.020	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4101F1
44 30 57.0 117 10 35.0 4
TRAIL CREEK
41 15 MINERAL
T/BROWNLEE RESERVOIR 130892
MINERAL RD BRDG 8 MI SW OF MINERAL
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	16 50		0.192	0.100	0.015	0.050	0.060
74/11/22	14 30		0.160	0.700	0.025	0.045	0.045
75/01/04	14 00		0.417	0.800	0.073	0.066	0.066
75/05/17	10 45		0.075	0.400	0.020	0.025	0.060
75/06/08	11 30		0.090	1.050	0.055	0.075	0.130
75/07/19	13 30		0.280	0.300	0.030	0.125	0.144
75/08/09	11 40		0.180	1.100	0.025	0.100	0.140
75/09/27	12 00		0.280	1.300	0.025	0.095	0.130

STORET RETRIEVAL DATE 76/08/12

4101G1
44 25 55.0 117 08 45.0 4
ROCK CREEK
41 15 OLDS FERRY
T/BROWNLEE RESERVOIR 130792
MINERAL RD BRDG 2.5 MI N OF HENLEY BASIN
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	15 30		0.128	0.100K	0.015	0.050	0.050
74/11/22	13 35		0.048	0.700	0.035	0.035	0.040
74/12/14	12 30		0.192	0.600	0.015	0.020	0.045
75/01/04	15 25		0.016	0.800	0.040	0.065	0.065
75/05/17	10 00		0.270	0.450	0.025	0.065	0.110
75/06/08	10 50		0.210	0.900	0.025	0.050	0.070
75/07/19	12 45		0.375	0.200	0.015	0.105	0.120
75/08/09	11 00		0.380	1.850	0.025	0.075	0.110
75/09/27	11 20		0.440	0.600	0.020	0.060	0.100

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4101H1
44 23 10.0 117 16 45.0 4
BURNT RIVER
41 BAKER CO HWY MAP
T/BROWNLEE RESERVOIR 130791
FOOT BRDG .5 MI NW OF HUNTINGTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	09	50	0.008	0.200		0.110	0.110
74/11/22	09	45	0.072	0.500	0.060	0.090	0.090
74/12/14	09	10	0.160	0.800	0.010	0.080	0.090
75/01/04	09	17	0.288	1.100	0.050	0.095	0.120
75/01/24	09	00	0.272	0.900	0.064	0.104	0.140
75/02/09	09	25	0.256	2.300	0.048	0.096	0.220
75/02/22	09	30	0.256	0.800	0.044	0.096	0.130
75/04/12	09	25	0.240	1.150	0.210	0.085	0.190
75/06/08	15	00	0.150	1.450	0.035	0.350	
75/07/19	10	00	0.155	0.650	0.025	0.155	0.240
75/08/09	08	20	0.040	0.800	0.025	0.140	0.220
75/09/27	00	00	0.020	1.000	0.035	0.115	0.180

STORET RETRIEVAL DATE 76/08/12

4101M2
44 21 40.0 117 14 30.0 4
BURNT RIVER
41 15 OLDS FERRY
T/BROWNLEE RESERVOIR 130792
SEC RD BRDG 1.2 MI NE OF HUNTINGTON
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	10 15		0.024	0.200	0.010	0.110	0.110
74/11/22	09 55		0.056	0.300	0.030	0.085	0.085
74/12/14	10 00		0.176	0.400	0.010	0.085	0.090
75/01/04	09 35		0.312	1.000	0.095	0.100	0.140
75/01/24	09 20		0.288	1.000	0.048	0.104	0.150
75/02/09	09 50		0.264	0.700	0.104	0.096	0.150
75/02/22	10 15		0.280	2.600	0.096	0.104	0.140
75/04/12	09 40		0.240	0.700	0.035	0.085	0.200
75/06/08	14 00		0.150	0.800	0.035	0.400	
75/07/19	10 30		0.160	0.700	0.025	0.160	0.270
75/08/09	08 35		0.045	1.100	0.030	0.140	0.230
75/09/27	08 55		0.015	1.200	0.060	0.115	0.220

STORET RETRIEVAL DATE 76/08/12

4101J1
44 25 52.0 117 08 50.0 4
HENLEY CREEK
41 15 OLDS FERRY
T/BROWNLEE RESERVOIR 130792
CLVRT ON MINERAL RD 2 MI N HENLEY BASIN
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	15 15		0.016	0.100K	0.010	0.075	0.075
74/11/22	13 30		0.016	0.300	0.022	0.075	0.075
74/12/14	12 30		0.016	0.500	0.010	0.070	0.070
75/05/17	13 20		0.040	0.825	0.040	0.075	0.100
75/06/08	10 40		0.025	0.750	0.025	0.910	
75/07/19	12 30		0.010	0.250	0.015	0.150	0.170
75/08/09	11 00		0.015	0.900	0.030	0.120	0.150
75/09/27	11 15		0.020	0.600	0.020	0.095	0.130

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/08/12

4101K1
44 26 15.0 117 08 40.0 4
LITTLE ROCK CREEK
41 15 OLDS FERRY
T/BROWNLEE RESERVOIR 130792
BNK JUST OFF MINERAL RD 19 M N WRM SPRGS
11EPALES 2111204
0000 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/10/20	15 40		0.304	0.250	0.020	0.040	0.042
74/11/22	13 40		0.208	0.800	0.065	0.035	0.040
74/12/14	12 35		0.416	0.500	0.017	0.045	0.045
75/05/17	10 10		0.450	1.350	0.045	0.055	0.080
75/06/08	11 00		0.720	0.450	0.025	0.073	0.097
75/07/19	13 00		0.420	0.150	0.035	0.110	0.160
75/08/09	11 10		0.600	0.650	0.035	0.120	0.190
75/09/27	11 25		0.640	0.600	0.020	0.080	0.110